

CLAIMS

I claim:

1. A device (40) for moving elevator doors (26), comprising:
a threaded ferromagnetic shaft (42);
5 a motor (44) that selectively rotates the shaft; and
at least one magnetic mover (48) adapted to be supported for movement with a door (26), the magnetic mover generating a magnetic field that causes the mover to move responsive to rotation of the shaft.
- 10 2. The device of claim 1, wherein the magnetic mover (48) comprises ferromagnetic members (50) on opposite sides of the shaft, each ferromagnetic member having a contoured surface (54) facing the shaft and a field generator (52) that selectively generates the magnetic field such that it passes from the contoured surfaces through the corresponding threads (56) on the shaft.
- 15 3. The device of claim 2, wherein the field generator (52) comprises at least one of a conductive wire coiled about a portion of the ferromagnetic members or a magnet.
- 20 4. The device of claim 2, wherein the contoured surfaces (54) include threads and including a nonmetallic filler (60) in spaces between the threads on the mover ferromagnetic members (50).
- 25 5. The device of claim 4, including a nonmetallic filler (62) in spaces between the threads on the shaft (42).
- 30 6. The device of claim 1, including a controller (46) that selectively varies a strength of the magnetic field of the mover (48) to thereby control movement of the mover relative to the shaft (42).
7. The device of claim 6, wherein the controller (46) controls the field to move the mover faster in a door opening direction than in a door closing direction.

8. The device of claim 6, wherein the controller (46) uses an indication of longitudinal movement of the mover (48) relative to the shaft (42) not corresponding to rotation of the shaft and responsively controls at least one of the motor or the magnetic field.

9. The device of claim 8, including at least one sensor (58) that provides an indication of slipping between the mover and the shaft to provide the indication of relative longitudinal movement.

10. The device of claim 1, wherein the shaft (42) has a first portion with a thread pitch in one direction and a second portion with a thread pitch in an opposite direction such that movers (48) associated with the first and second portions move in opposite directions responsive to rotation of the shaft.

11. The device of claim 1, including a controller (46) that causes the motor (44) to rotate the shaft (42) faster in a door opening direction than in a door closing direction.

12. The device of claim 1, wherein the mover (48) comprises a permanent magnet (58).

13. An elevator door assembly, comprising:
at least one door (26) that is moveable between an open and a closed position;
a threaded ferromagnetic shaft (42);
5 a motor (44) that selectively rotates the shaft; and
at least one magnetic mover (48) supported for movement with the door, the
magnetic mover generating a magnetic field that causes the door to move between the
open and closed positions responsive to rotation of the shaft.
- 10 14. The assembly of claim 13, wherein the magnetic mover (48) comprises
ferromagnetic members (50) on opposite sides of the shaft, each ferromagnetic
member having a contoured surface (54) facing the shaft and a field generator (52)
that selectively generates the magnetic field such that it passes from the contoured
surface (54) through the corresponding threads (56) on the shaft (42).
- 15 15. The assembly of claim 13, including a controller (46) that selectively varies a
strength of the magnetic field of the mover (48) to thereby control movement of the
mover relative to the shaft (42).
- 20 16. The assembly of claim 13, including two doors (26) each having at least one
associated mover (48) and wherein the shaft (42) has a first portion with a thread pitch
in one direction associated with one of the doors and a second portion with a thread
pitch in an opposite direction associated with the other door such that the doors move
in opposite directions responsive to rotation of the shaft.

25

17. A method of moving an elevator door (26) that has a magnetic mover (48) associated with the door, the mover interacting with a threaded ferromagnetic shaft (42), comprising the steps of:

- 5 selectively rotating the shaft (42); and
 generating a magnetic field that causes the mover (48) and the door (26) to move longitudinally parallel to the shaft responsive to rotation of the shaft.

18. The method of claim 17, including selectively varying a strength of the
10 magnetic field.

19. The method of claim 17, including increasing a speed of rotation of the shaft (42) and a strength of the magnetic field when the door (26) is moving from a closed position toward an open position.

15

20. The method of claim 17, including determining whether the mover (48) moves longitudinally relative to the shaft other than responsive to rotation of the shaft (42) and responsively changing one of a speed of rotation of the shaft or a strength of the magnetic field when there is such relative movement.

20